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BLACK SPRUCE SITE QUALITY KEY FOR THE NORTHWESTERN REGION OF ONTARIO

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INTRODUCTION

Determination of forest site quality is becoming more important as increasing emphasis is placed on directing silvicultural investments toward those sites which yield the maximum financial return on investment. The higher the site quality for a particular species, the more wood that can be harvested within a given period of time. The relative ability of a site to support the growth of a particular species can be estimated by determining the site index of the species as it occurs on the site. Site index is defined as the height of dominant and/or codominant trees at a given index age, usually 50 years for boreal sites and species (Carmean 1975). Where stands are partially or fully cut, uneven-aged, young or the area is occupied by a different species, site quality must be estimated indirectly using topography, vegetation or soil characteristics that are closely related to the productivity of the species of interest.

A key (Figure 1), which allows field estimation of site quality for black spruce (*Picea mariana* (Mill.) B.S.P.), was developed for use in the Northwestern Region of Ontario (Buse and Baker 1991). This note summarizes the development, limitations and applications of the key.

DEVELOPMENT OF KEY

Eighty-one plots, most of them previously established by the Forest Ecosystem Classification (FEC) program (Sims *et al.* 1989), were sampled to determine soil and site characteristics and black spruce site index. The plots were located in fully stocked, even-aged stands with greater than 70% black spruce in site regions 5300, 4300 and 3300 (Hills 1961) of Northwestern Region.

On each plot, one tree representing average dominant height and average diameter was cut and sectioned to determine height growth patterns. Sample plot site indices ranged from 4.4 to 18.8 m at breast height age 50.

Soil and site characteristics were related to site index using regression analysis to determine the features which best defined black spruce growth on different sites. Three distinct soil groups: organic and peaty phase soils, shallow mineral soils and deep mineral soils, became apparent.

Black spruce site quality was found to be closely related to features influencing moisture and nutrient relationships within all three groups. Black spruce on organic soil is slow growing but

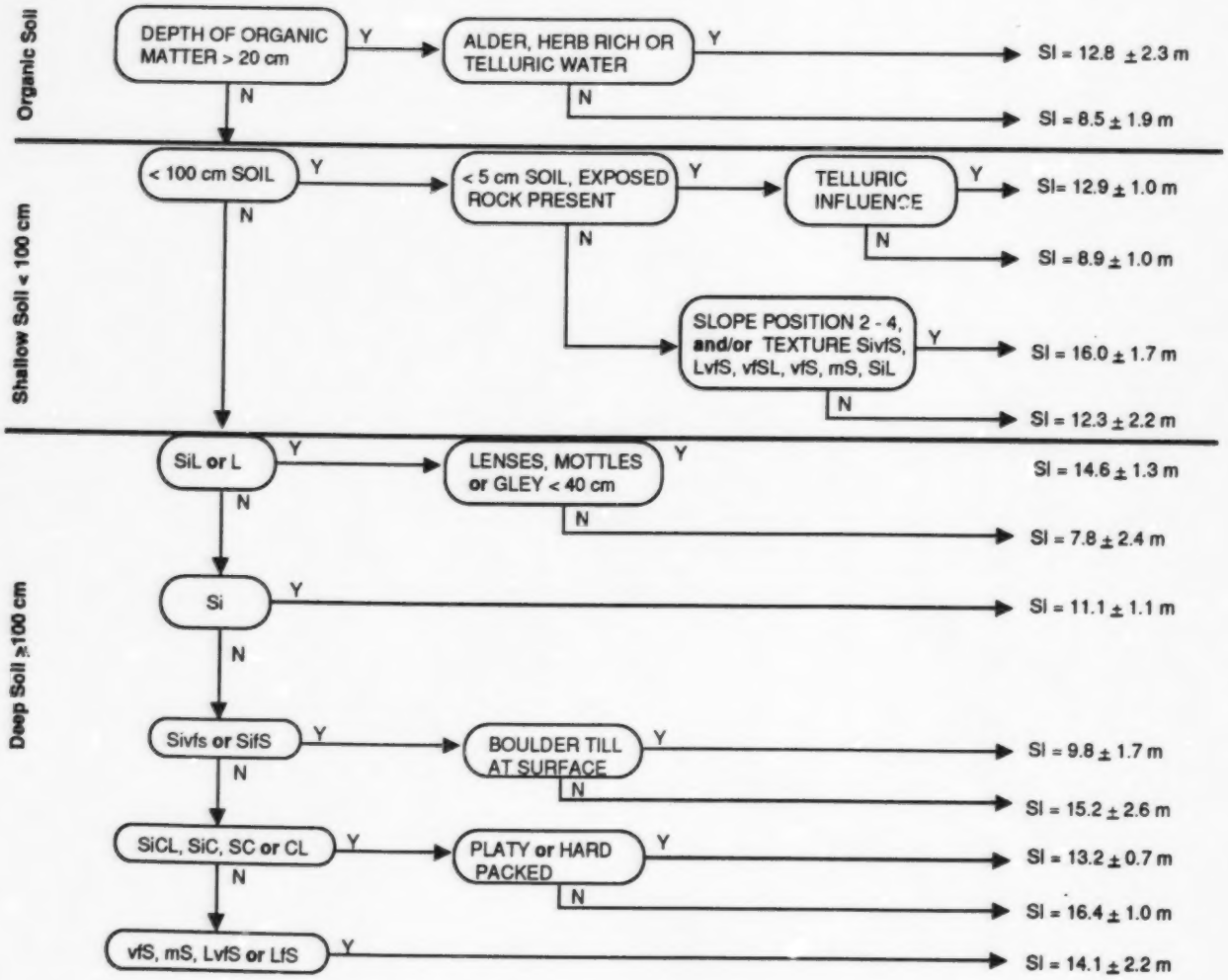

Figure 1. Black Spruce Site Productivity Key for Northwestern Region

(Site Regions 5300, 4300, 3300)

these sites can be productive if telluric (downslope movement of nutrient enriched water) water is available. Similarly site quality on extremely shallow soils is poor unless telluric water is available. On deep mineral soils, black spruce site quality is determined by soil texture and moisture relationships.

LIMITATIONS

There are a few factors which should be kept in mind when using this key in the field. The key is based on a small number of plots, which results in a fair amount of variability in site index for some sites. Not all soil types are represented; for example, coarse sands and pure clays do not appear in the key, because of the limited nature of the database.

Only the organic and shallow soil portions of the key are related to FEC soil types. The variability of site index within FEC types for the deep mineral soils was too large to allow the development of a key based solely on FEC soil types as was done for jack pine (Buse and LeBlanc 1990).

APPLICATIONS

The key is based on easily identifiable features of soil and topography which can be determined quickly in the field. It is separated into organic and peaty phase soils, shallow mineral soils (<100 cm) and deep mineral soils (>100 cm) and can be used to decide the potential for spruce on a variety of sites. Black spruce growth was found to be best on fresh to moist, loamy or clayey sites (fine textured soils) with greater than 30 cm of soil.

To use the site quality key, start at the top left and follow featured soil and site characteristics through to determine the predicted site index for black spruce. For example, a site with >100 cm silty very fine sand, without boulder till at the surface should have a site index in the range of 15 m.

Soil textures, slope positions and other terms used in the key are defined in the NWO FEC guide (Sims *et al.* 1989) and/or the field manual for describing soils (O.I.P. 1985).

Once the site index of black spruce has been determined for given sites on a management unit, the areas where it should be regenerated can be selected. Low site quality areas may be regenerated naturally, by seeding or to another species which is better suited to the site. Plantations should be established on areas of high site quality for the species chosen.

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